# Armed Forces College of Medicine
# AFCM

# Tracts 1

By Professor
**Dr Shahira Youssef**
Professor of Anatomy and Embryology

# ILOS

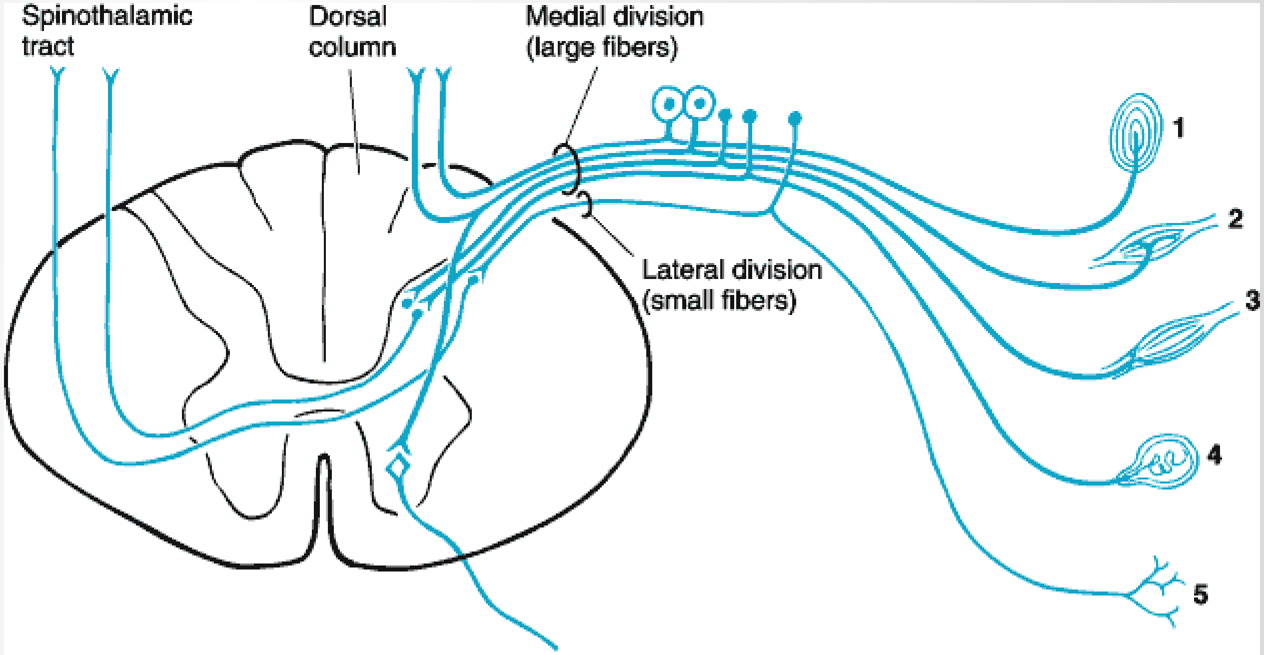
- **Describe** the function, beginning , position , lamination and termination of ascending tracts

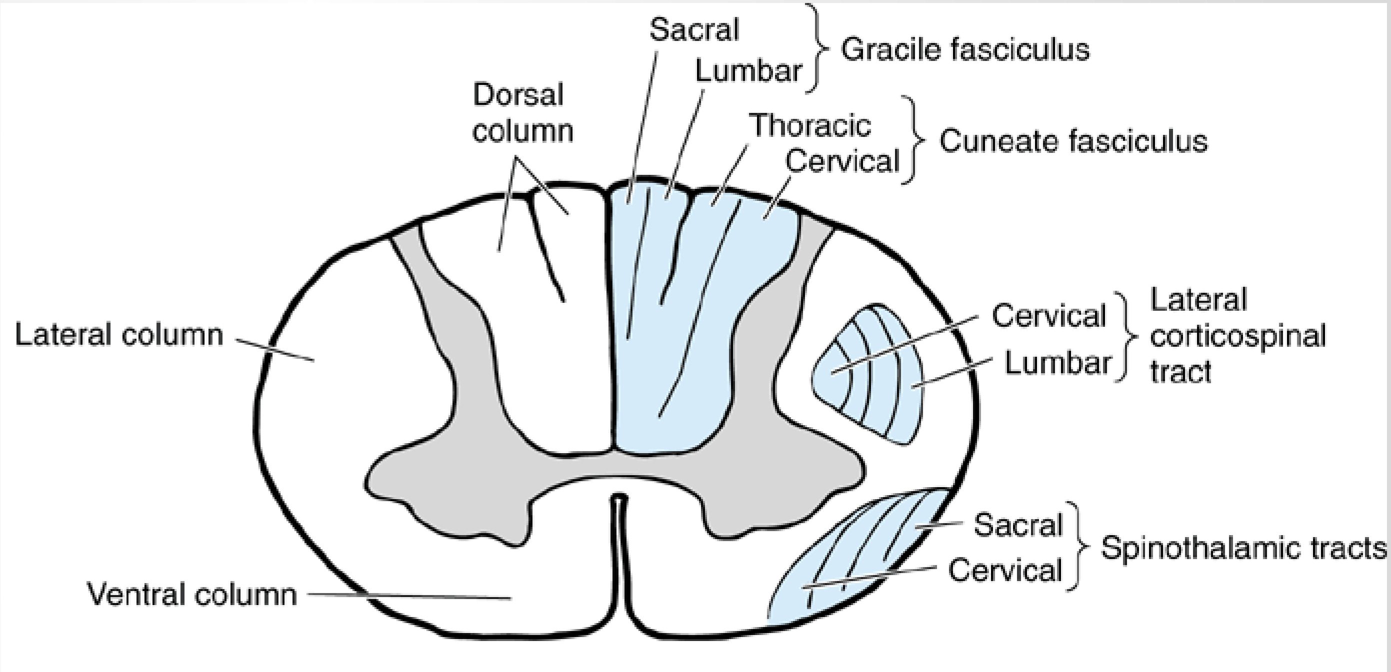
# Tracts: part of sensory pathways

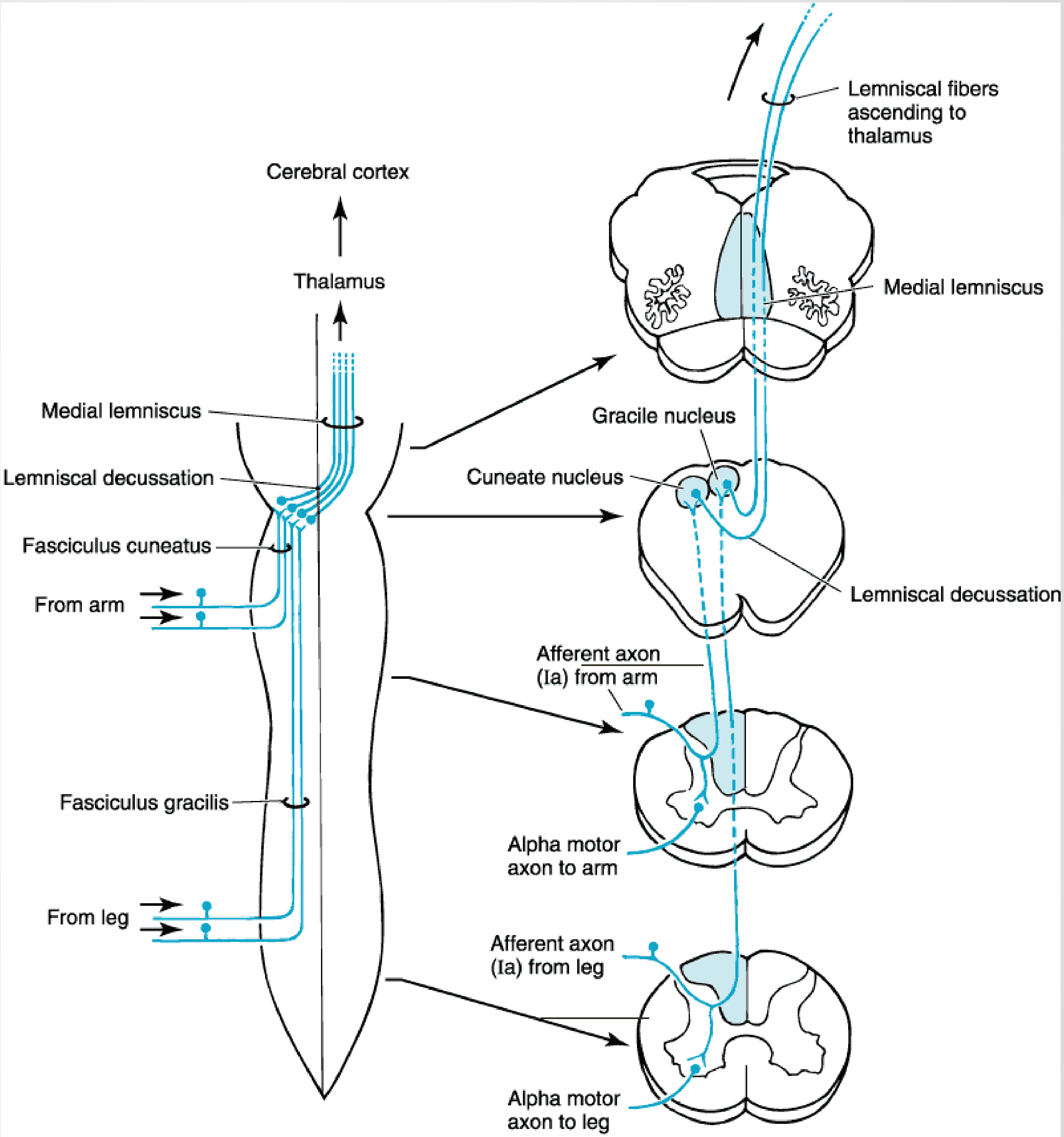
- **Tracts**
  - **Ascending tracts**
    - **Proprioception**
      - 1-Conscious
      - 2-Unconscious
    - **Anterolateral system**
      - Lateral spinothalamic
      - Ventral spinothalamic
  - **Descending tracts**
    - Pyramidal and extrapyramidal

# Gracile & Cuneate tracts Posterior column tracts

- Pathway of conscious **proprioception sense of position, movement, vibration , tactile localization , tactile discrimination & stereognosis**
- Gracile carry from **lower** part of body below T6
- Cuneate carry from **upper** part of body above T6
- Occupy posterior white column gracile is medial
- Formed by central process of dorsal root ganglia , fibers enter spinal cord via dorsal root
- Lamination : coccygeal& sacral fibers are most medial and cervical are lateral
- End in gracile and cuneate nuclei in medulla

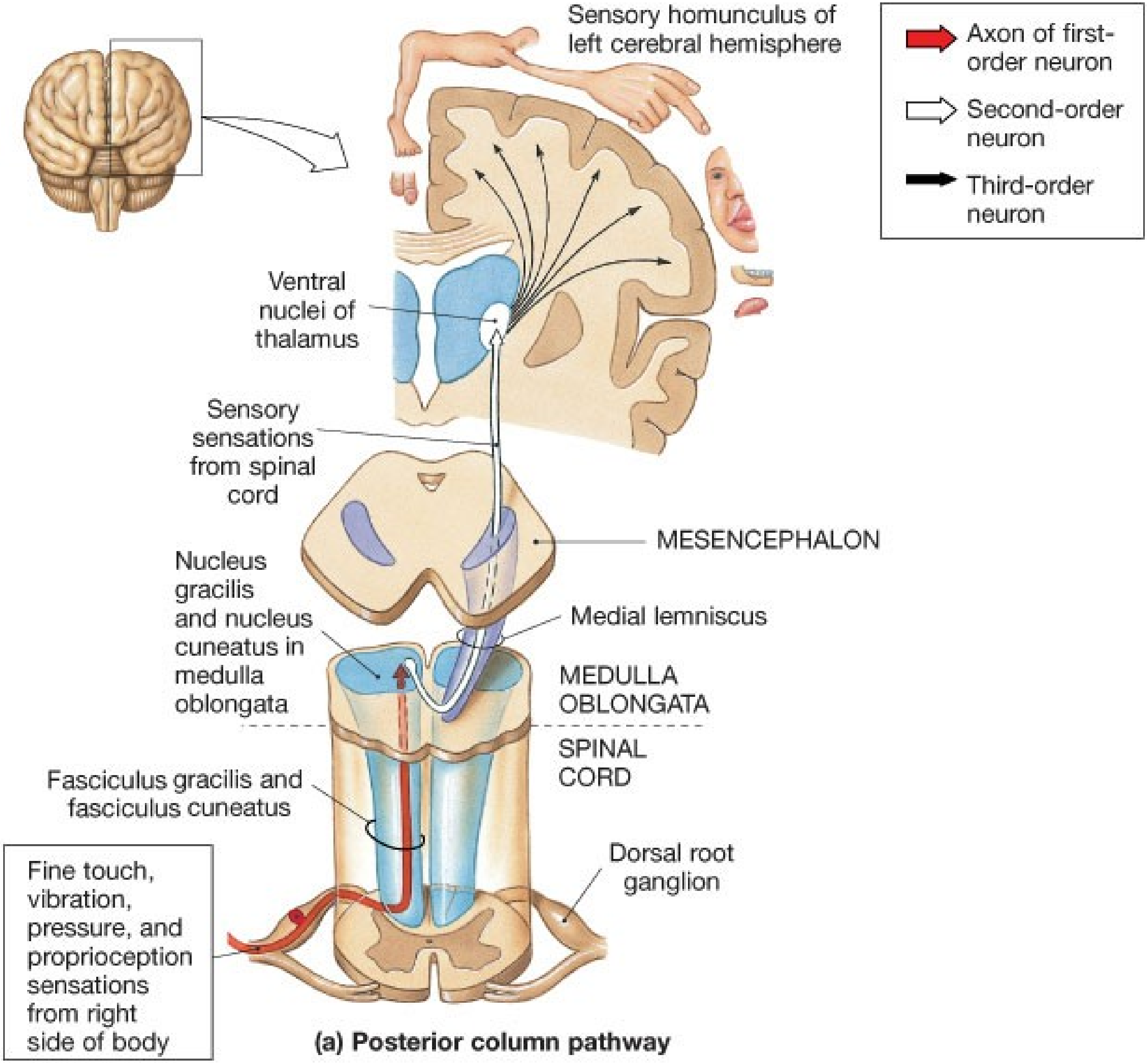

Spinothalamic tract
Dorsal column
Medial division (large fibers)
Lateral division (small fibers)
1
2
3
4
5


Sacral
Lumbar
Gracile fasciculus
Dorsal column
Thoracic
Cervical
Cuneate fasciculus
Lateral column
Cervical
Lumbar
Lateral corticospinal tract
Sacral
Cervical
Spinothalamic tracts
Ventral column


Lemniscal fibers ascending to thalamus
Cerebral cortex
Thalamus
Medial lemniscus
Medial lemniscus
Gracile nucleus
Cuneate nucleus
Lemniscal decussation
Lemniscal decussation
Fasciculus cuneatus
From arm
Afferent axon (Ia) from arm
Fasciculus gracilis
Alpha motor axon to arm
From leg
Afferent axon (Ia) from leg
Alpha motor axon to leg

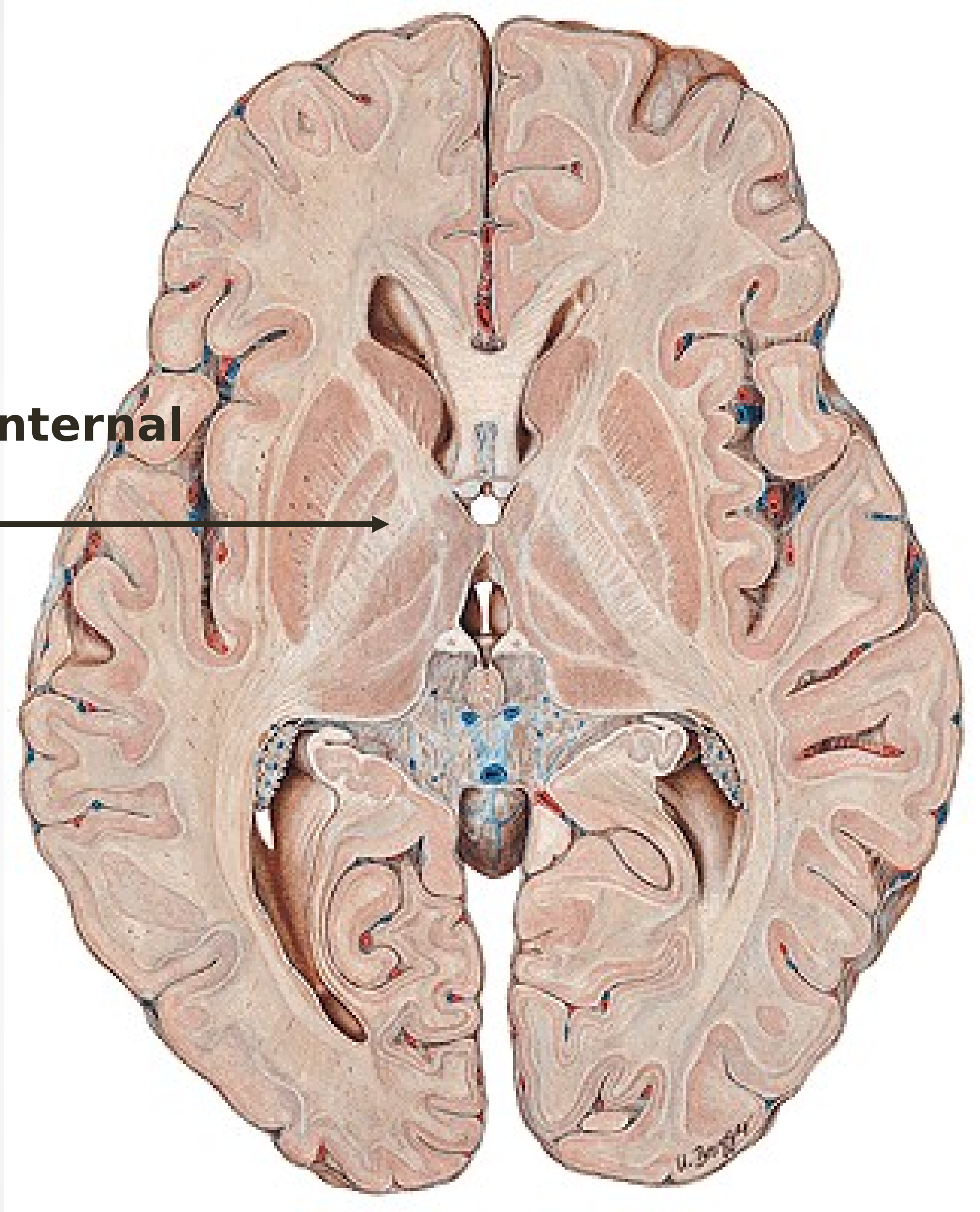
# Pathway of proprioception

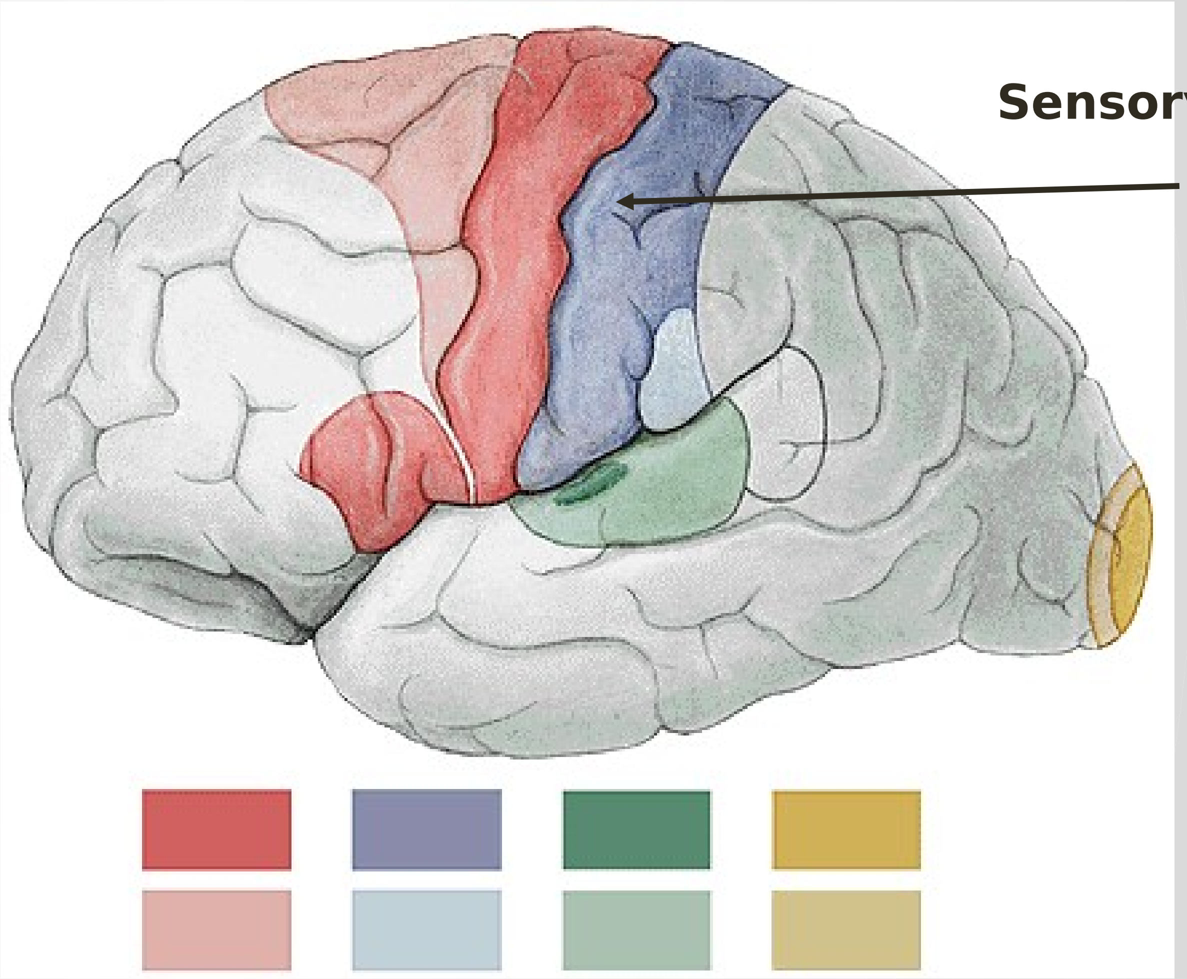
- **First neuron** : dorsal root ganglia
- **Second neuron** :  axons of gracile and cuneate nuclei cross median plane form internal arcuate fibers or  sensory decussation & ascend in brain stem as medial lemniscus to reach thalamus
- **Third neuron** : ventral posterolateral nucleus of thalamus  send fibers in internal capsule to reach sensory area of cerebral cortex




**(a) Posterior column pathway**

**sterior limb of internal capsule**




Sensory area

# Unconscious Proprioception

| | |
|---|---|
| **Posterior spinocerebellar** | • Carries proprioception from lower limb& trunk |
| **Anterior spinocerebellar** | • Carries proprioception from lower limb |
| **Spino-olivary** | • Carries from upper and lower limbs |

# Spino- cerebellar tracts

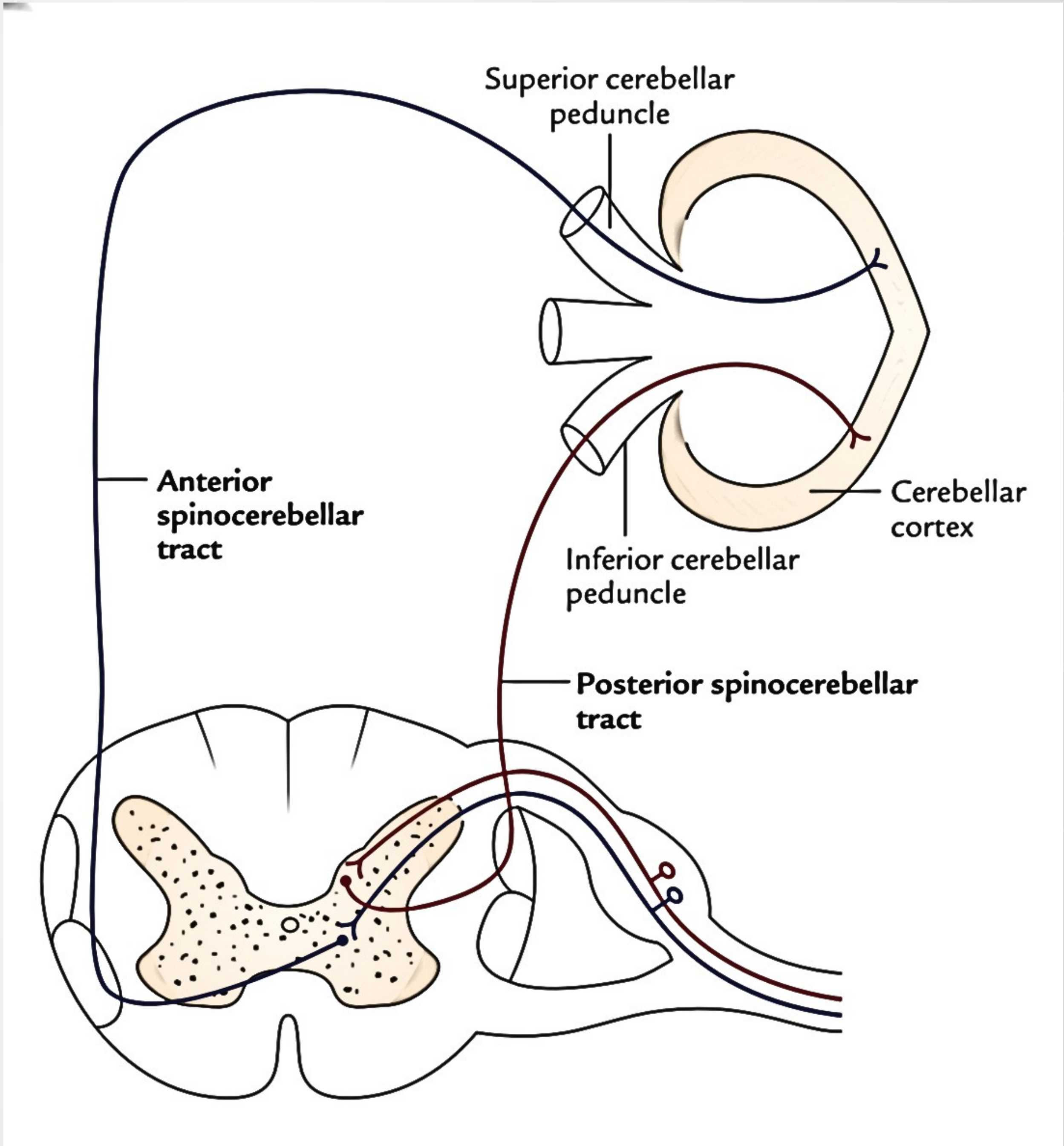
**Posterior spino--- cerebellar tract:**

- Formed of peripheral process of cell of dorsal root ganglia
- Central process enter spinal cord via dorsal root
- Ends on Clarks nucleus
- Ascend ipsilateral in lateral white column
- Enters cerebellum via……… inferior cerebellar peduncle

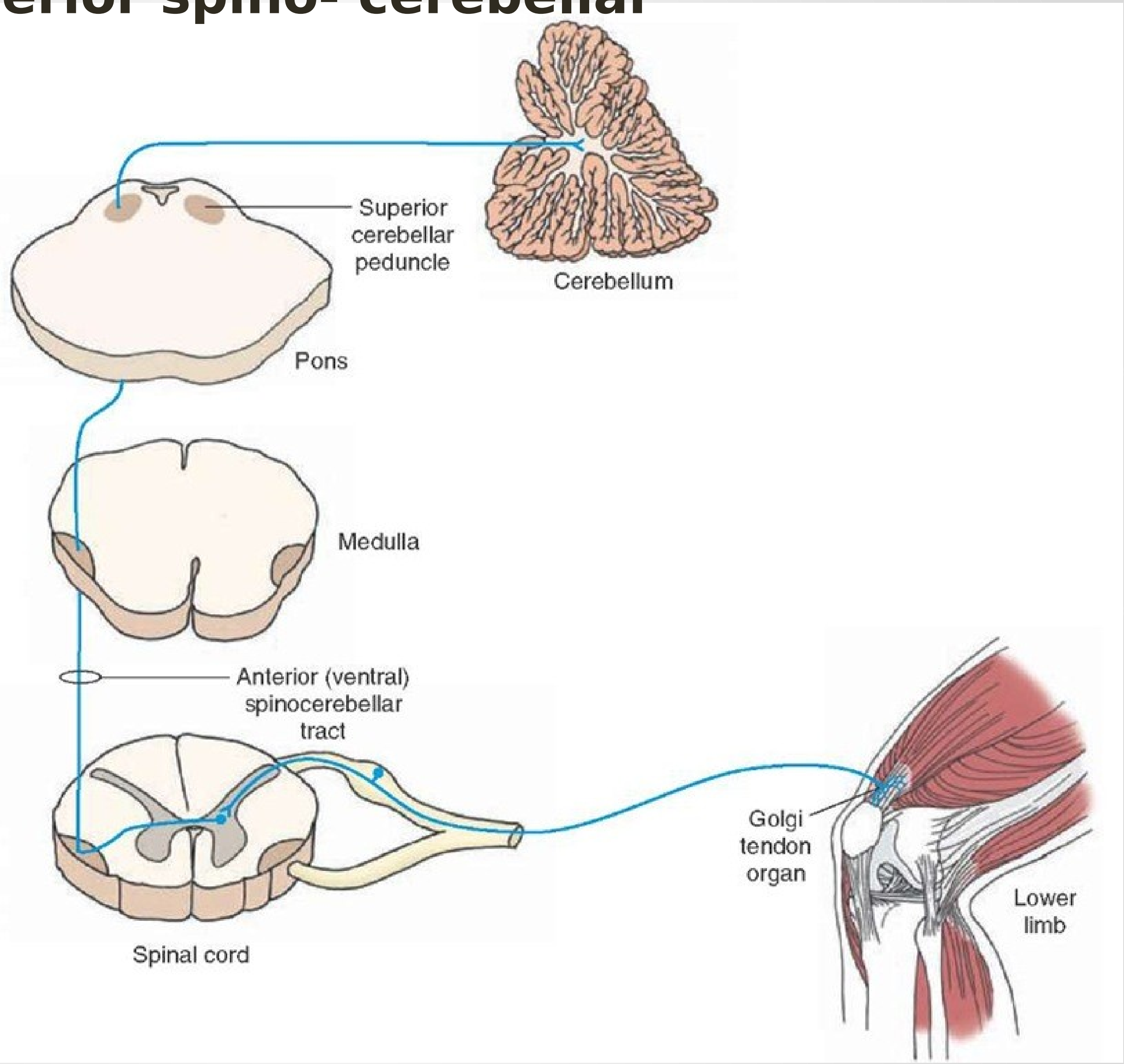
**Anterior spino-cerebellar tract**

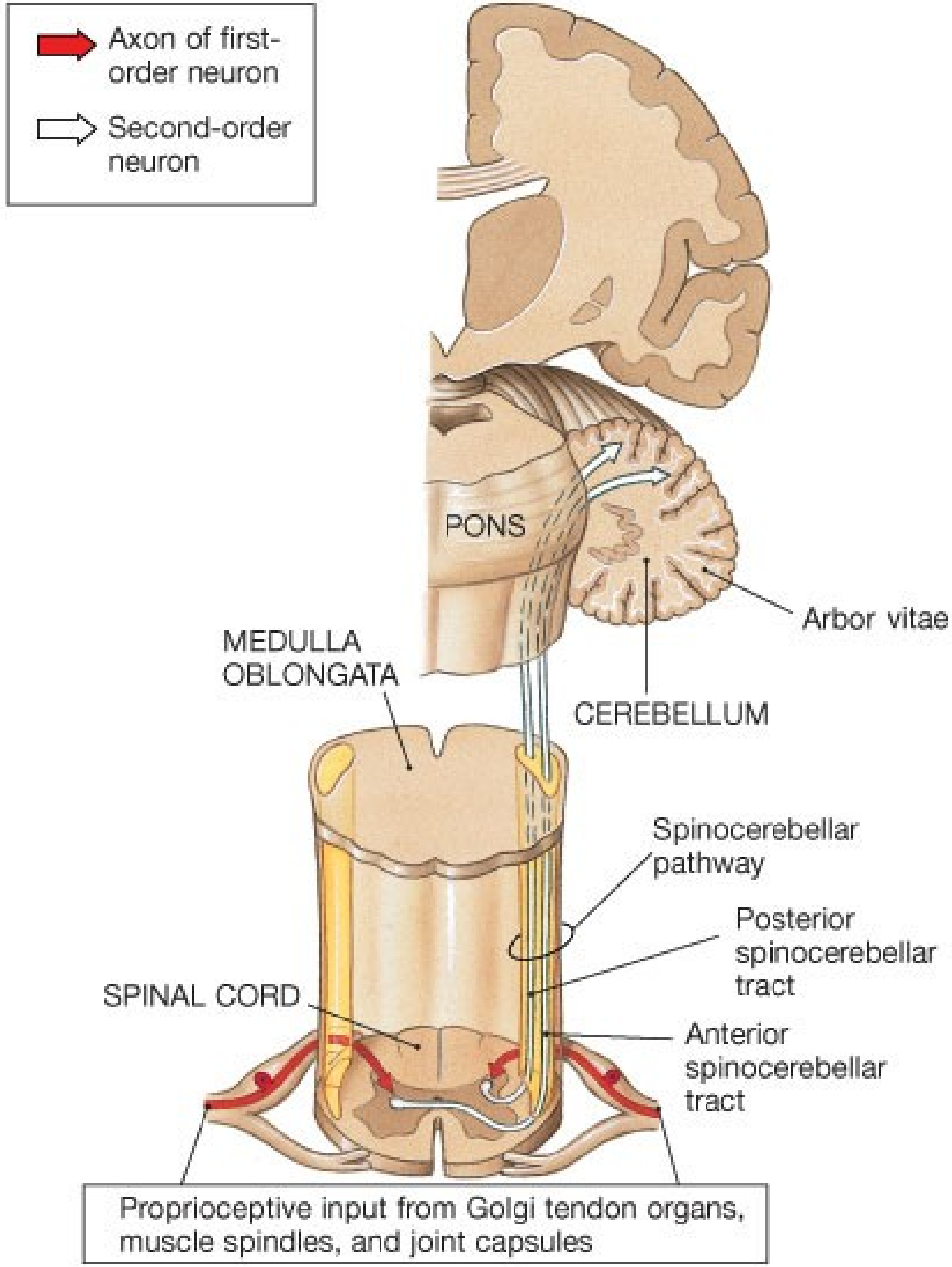
- Formed of peripheral process of cell of dorsal root ganglia
- Central process enter spinal cord via dorsal root
- Ends on Clarks nucleus
- Few fibers decussate and few remain ipsilateral
- Enter cerebellum via superior peduncle, and then recross again to reach ipsilateral cerebellum

# Spino cerebellar tracts

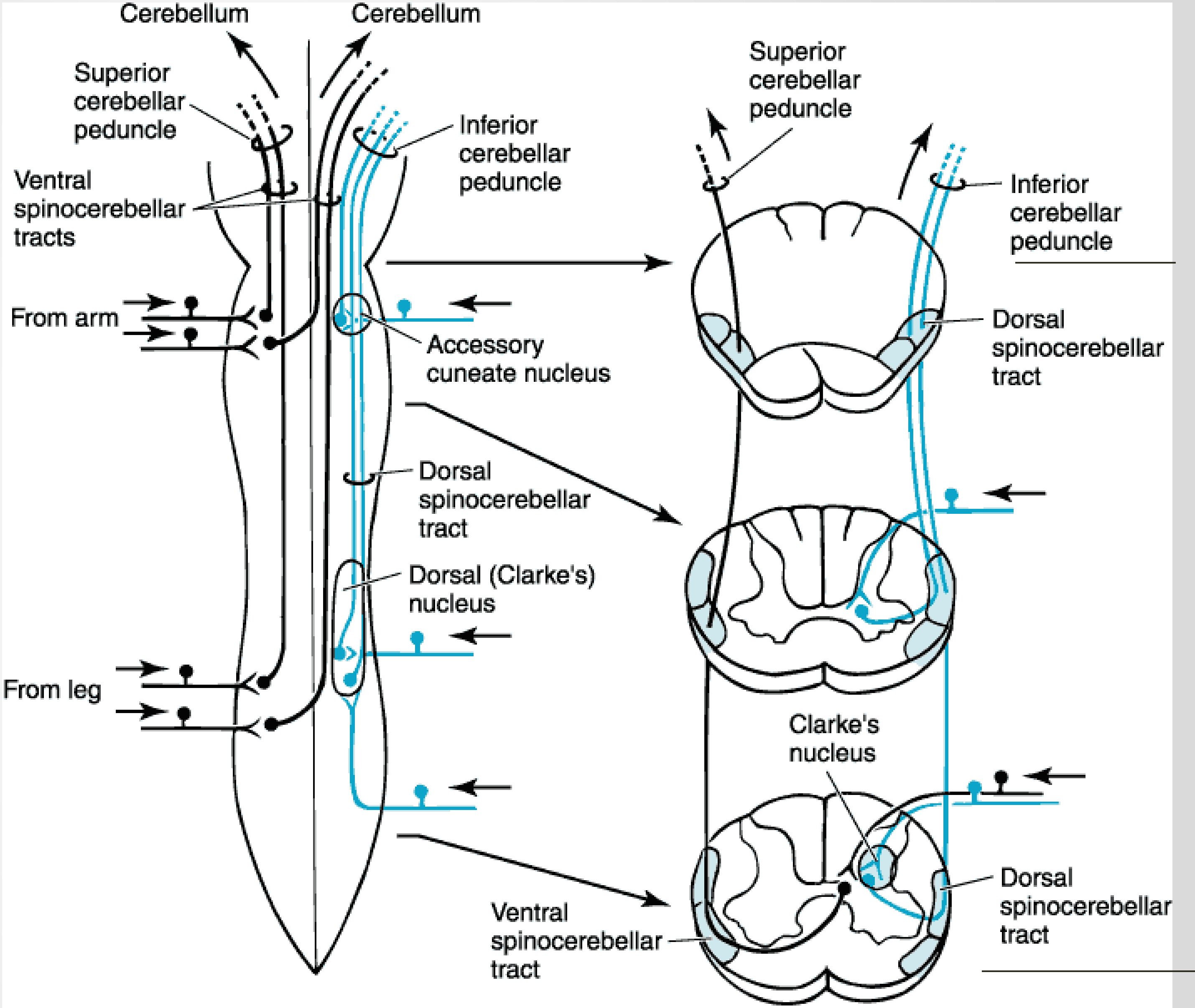


# Posterior spino- cerebellar



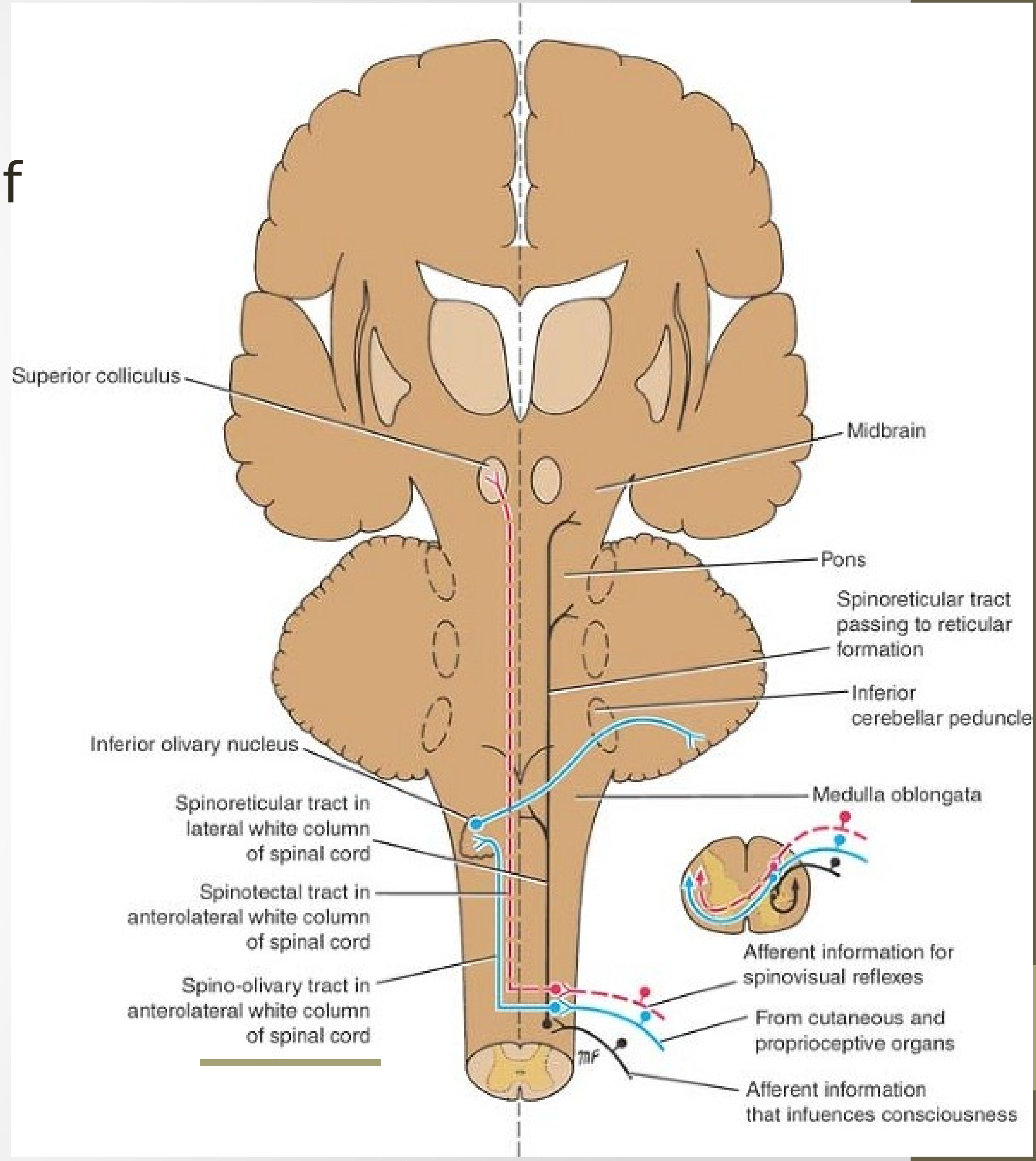


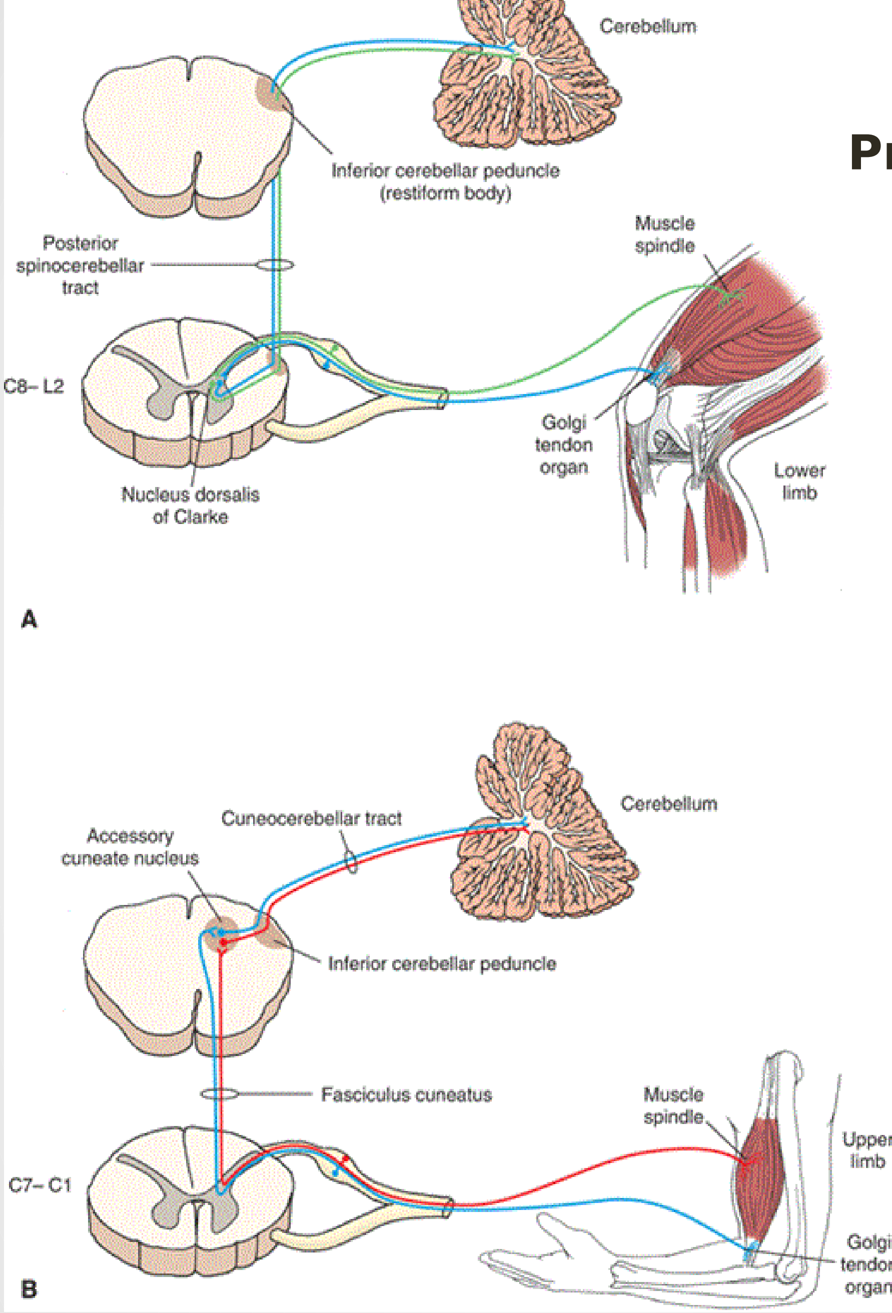

**(d) Spinocerebellar pathway**


Cerebellum
Cerebellum
Superior cerebellar peduncle
Inferior cerebellar peduncle
Ventral spinocerebellar tracts
From arm
Accessory cuneate nucleus
Dorsal spinocerebellar tract
Dorsal (Clarke's) nucleus
From leg
Superior cerebellar peduncle
Inferior cerebellar peduncle
Dorsal spinocerebellar tract
Clarke's nucleus
Dorsal spinocerebellar tract
Ventral spinocerebellar tract

# Spino-olivary

- Fibers cross
- Ascend at junction of lateral &
ventral white matter
- End in contralateral olivary nucleus






## Proprioception of upper limb

- Proprioception from upper limb to accessory cuneate nucleus
- Fibers from accessory cuneate form external arcuate fibers
- Reach ipsilateral cerebellum

# Antero lateral system
# Lateral Spino-thalamic Tract

- Carries pain and temperature , it lies in lateral white column
- Begins from lamina I,IV, VIII
- Lamination cervical fibers are medial
- End on VPL of thalamus

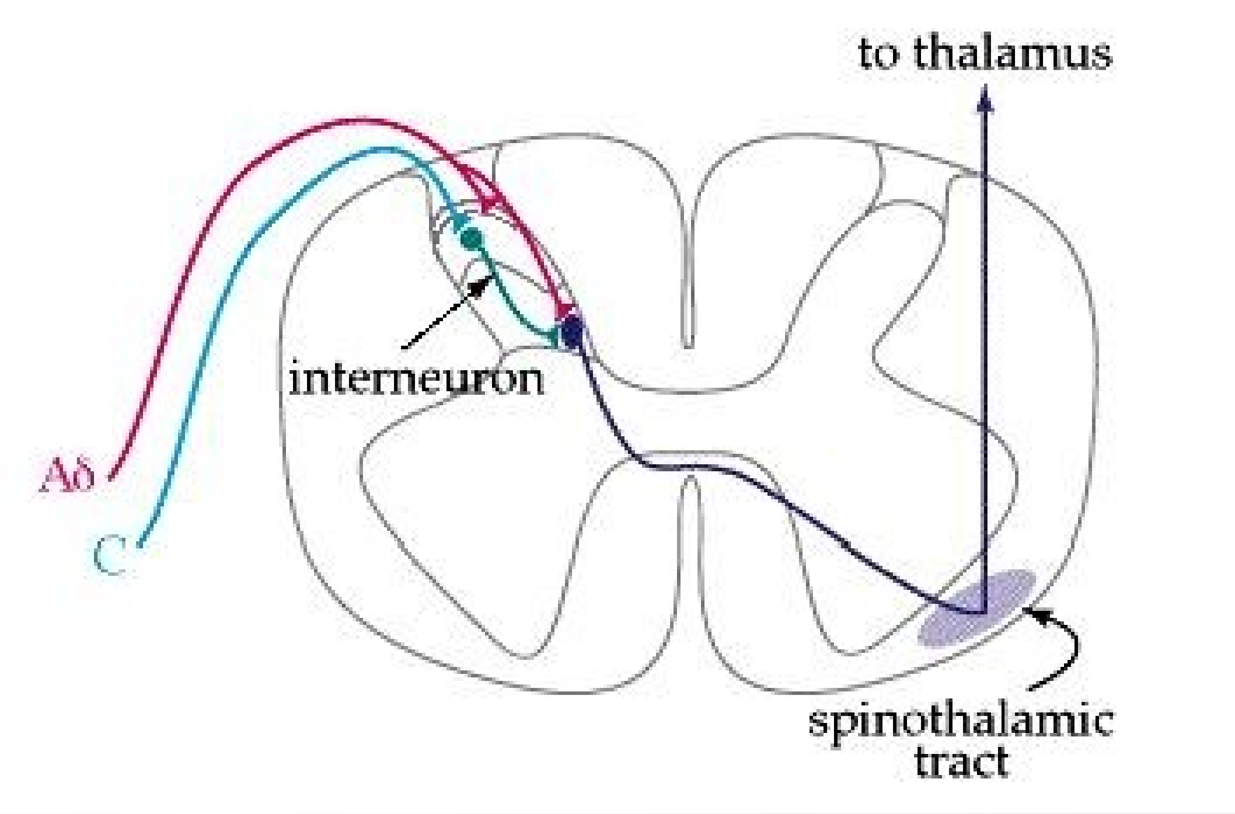
**Pain pathway**

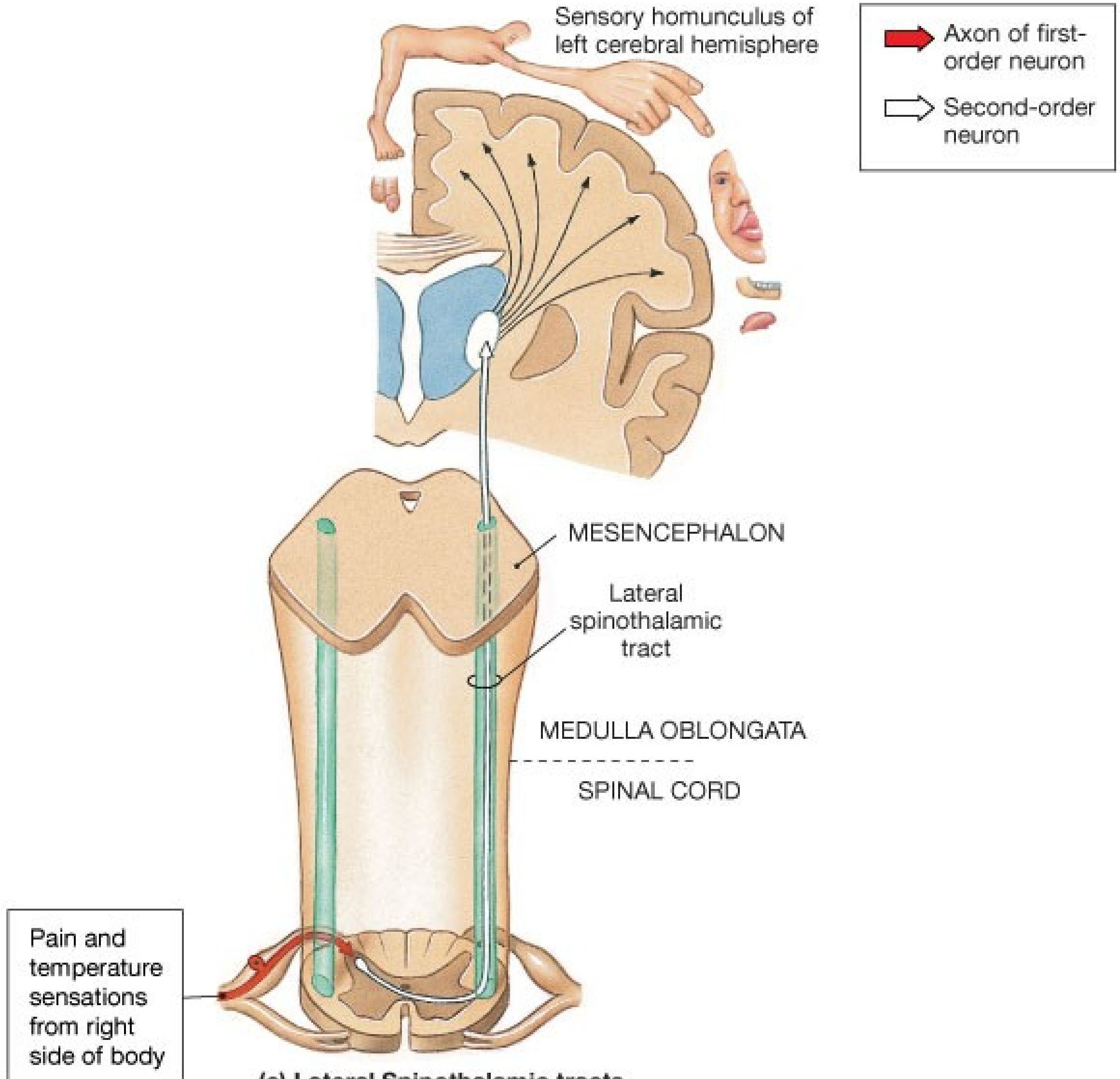
F**irst neuron** ;Central process of dorsal root ganglia enters dorsal root ends on laminal I, IV, VIII

**Second neuron** :

- Axons of lamina cross in ventral white commissure ascend in lateral white column cervical fibers are medial & sacral are lateral
- Fibers ascend in brain stem as spinal lemniscus
- Reach ventral posterior lateral nucleus of thalamus

**Third neuron** :Axons of VPLN pass in posterior limb of internal capsule to reach sensory area


to thalamus
interneuron
Aδ
C
spinothalamic
tract




(c) Lateral Spinothalamic tracts

# Antero lateral system
# Ventral spinothalamic

- Carries touch and pressure, lies in anterior white column
- Begins from lamina IV- VII
- Cervical fibers are medial
- End on VPL

**Pathway of touch & pressure**

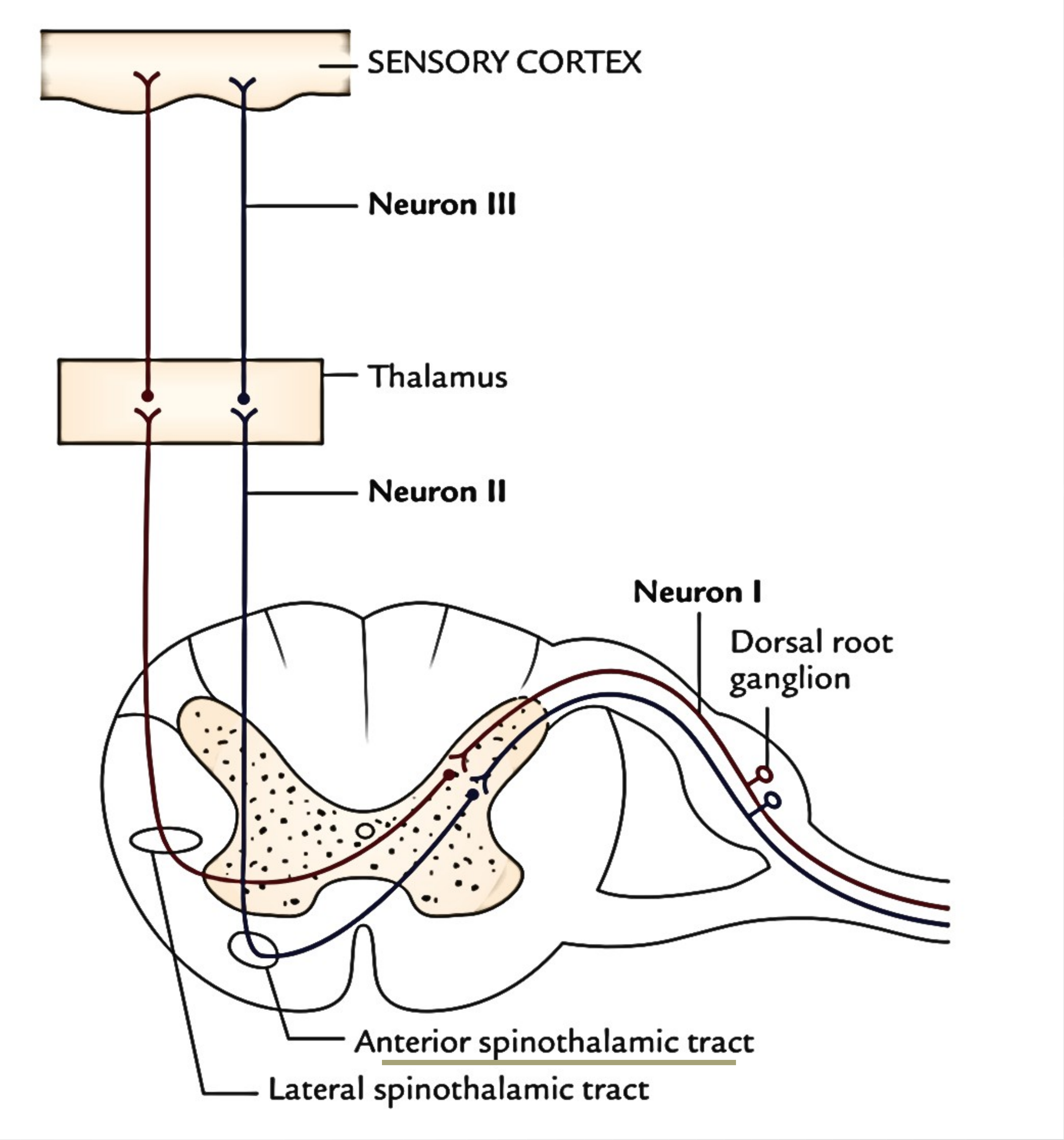
**First neuron** :Central processes of dorsal root ganglia enter spinal cord via dorsal root end on lamina IV-VII

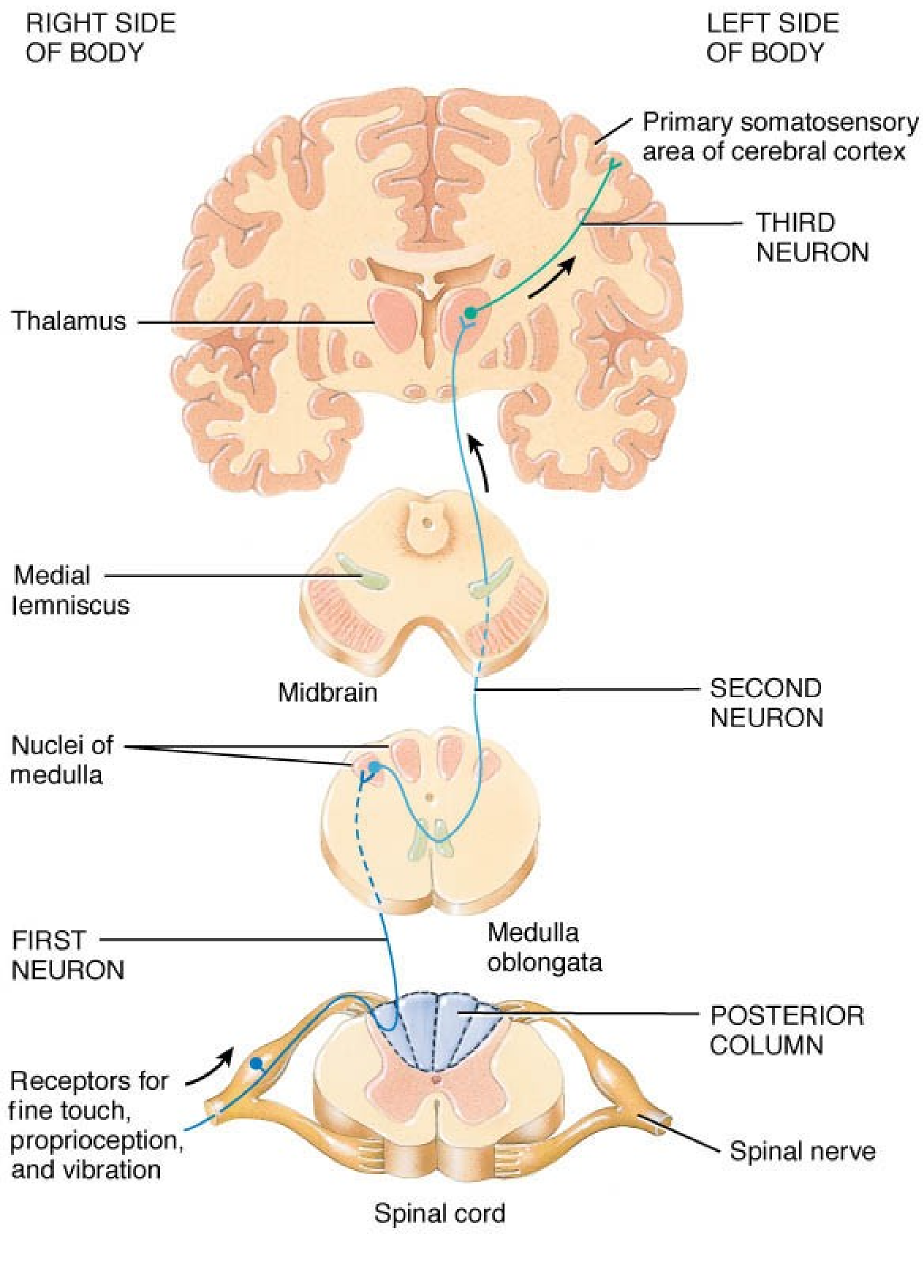
**Second neuron** :

- Axons of lamina cross in ventral white column ascend as ventral spinothalamic tract, cervical fibers are medial
- Ascends in brain stem , joins medial lemniscus
- Reach VPL of thalamus

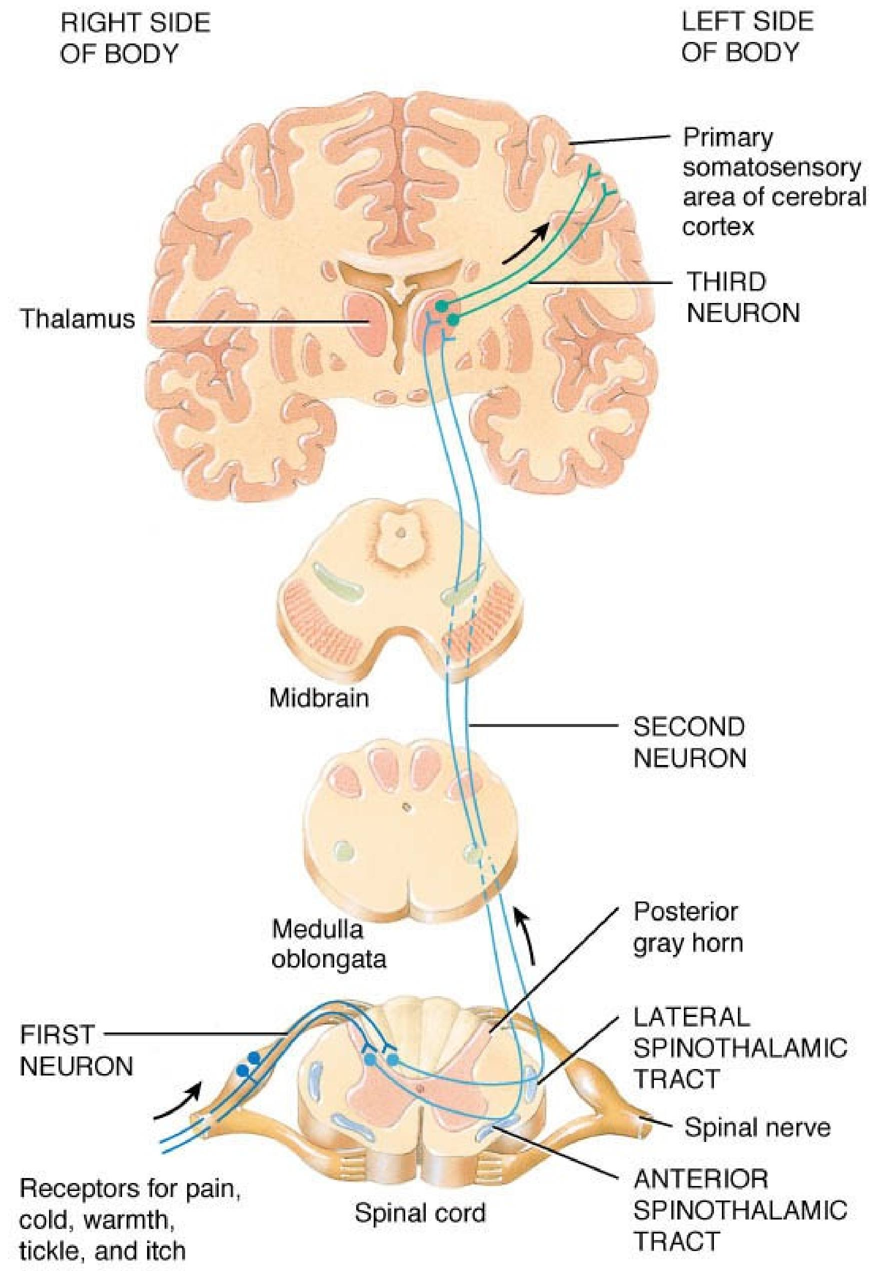
**Third neuron** :

- fibers of VPL Pass in posterior limb of internal capsule
- Reach sensory area of cerebral cortex


SENSORY CORTEX
Neuron III
Thalamus
Neuron II
Neuron I
Dorsal root ganglion
Anterior spinothalamic tract
Lateral spinothalamic tract




(a) Posterior column–medial lemniscus pathway




(b) Anterolateral (spinothalamic) pathways

# Other Ascending Tracts

**Spino- reticular**

- In lateral & ventral white column
- Mostly crossed
- End in pontine and medullary reticular formation
- Route for slow dull pain

**Spino-tectal**

- In lateral white column
- mostly Crossed
- End in superior colliculus of mid brain
- Head turning towards source of pain


THANK YOU